PATENT
Docket No.: HI03027USU (P02017US)

I. IN THE SPECIFICATION

Please amend the specification as follows:

Please replace the paragraph on page 2, lines 13 – 26, which begins with "The shape of an acoustic waveguide", with the following rewritten paragraph:

- - The shape of an acoustic waveguide affects the frequency response, polar pattern and the level of harmonic distortion of sound waves as they propagate away from the acoustic waveguide. As loudspeakers produce sound waves, waveguides are used to control the characteristics of the acoustic wave propagation. Current horn approaches include acoustic waveguide designs that have extruded curves that define the horizontal and vertical curvature in sheet surfaces. Other acoustic waveguide design approaches have designs that sweep the curvature about a point in space to create a quadratic surface (such as a hyperboloid.) In these examples, the intersection of the resulting four surfaces in a horn forms an interior surface that ~~function~~ functions as the acoustic waveguide. The resulting acoustic waveguide has a circular entrance at the throat of the horn and an exit at the mouth. Current horn approaches often include a diffraction slot that is usually a rectangular slot, or a slice of a cylinder, in the throat and is defined as the narrowest width (height) of the horn surface to further control the characteristics of the acoustic wave propagation. - -

Please replace the paragraph beginning on page 4, line 26, and ending on page 5, line 7, which begins with "FIG. 1 illustrates an acoustic waveguide 100", with the following rewritten paragraph:

- - FIG. 1 illustrates an acoustic waveguide 100 formed by a continuous three-dimensional curved surface. The acoustic waveguide has a circular throat end 102 and a closed control curve that forms a mouth 104. The form of the acoustic waveguide may have an upper vertical control curve 106, a lower vertical control curve 108, a right horizontal control curve 110, and a left horizontal control curve 112. Each control curve may be coincident with the surface of the acoustic waveguide in addition to the circular throat end 102 and the closed control curve that forms the mouth 104. The right horizontal control curve 110 and left horizontal control curve 112 are shown converging as they move from the mouth 104 or throat end 102 and then diverging as they approach the other end of the acoustic waveguide 100. The right horizontal control curve 110 and left horizontal control curve 112 may be mirrored about an imaginary centerline 114. Similarly, the upper vertical control curve 106 and the lower vertical control curve 108 may be mirrored about the imaginary centerline 114. The control curves rest in the horizontal and vertical planes and may also be free of any discontinuities, i.e. they may be continuous curves, such as, but not limited to, convergent-divergent, rational B-spline, parabolic, hyperbolic, ellipsoidal, linear, or exponential curves. In the exemplary embodiment shown in FIG. 1, control curves 106, 108, 110 and 112 are <u>convergent-divergent</u> ~~convex~~ relative to the centerline 114<u>, in that each control curve 106, 108, 110, and 112 includes a portion that</u>

curves toward the centerline 114 and another portion that curves away from the centerline 114. - -

Please replace the paragraph beginning on page 5, line 26, and ending on page 6, line 2, which begins with "A least-energy-surface", with the following paragraph:

- - A least-energy-surface may be a surface that passes through the specified controlling geometry in a manner that provides the minimum change in curvature when the rate of change of local curvature change is integrated in the mathematical sense (summed) over the entire surface. Alternately, the least-energy-surface may be mathematically one of the simplest equations representing the surface. Typically, this may be represented by the lowest order polynomial, or the factored expression with the least number of poles and zeros that causes a surface to go through the curves. The least-energy-surface in acoustic waveguide 100 is defined by the upper vertical, lower vertical, left horizontal, and right horizontal control curves 106, 108, 110 and 112 in addition to the circular throat 102 and the closed control curve of the mouth 104. Further, the acoustic waveguide 100 defined by the least-energy-surface eliminates the need for [[a]] diffraction slots. Instead the area in waveguide 100 of narrowest width or height pass through the continuous three-dimensional curved surface that allows the wave front to expand smoothly and remain attached to the side wall of the wave guide, without needing to rely on geometric diffraction to produce constant directivity or constant coverage. - -

Please replace the paragraph on page 6, lines 24 – 34, which begins with "In FIG. 4, an illustration of the plane or top view 400", with the following rewritten paragraph:

- - In FIG. 4, an illustration of the plane or top view 400 of the acoustic waveguide 100 of FIG. 1 is shown. The right horizontal control curve 110 and left horizontal control curve 112 may be symmetric about imaginary line 208. In an ideal embodiment, discontinuities are minimized in the control curves 110 or 112, such that the tangent to either of the control curves 110 or 112 is always positive. Because the surfaces portions formed by the right horizontal curve 110 or the left horizontal control curve 112, the circular throat end 102, and the closed control curve of the mouth 104 form a three-dimensional surface, the continuous ~~edges~~ edge 402 of the right wall 204 and the continuous edge 404 of the left ~~206~~ surface portion 206 extend past the respective control curve 110 or 112. In an alternate embodiment, it may be possible to have continuous edges that do not extend past respective control curves. - -

Please replace the paragraph on page 7, lines 7 – 21, which begins with "In FIG. 5", with the following rewritten paragraph:

- - In FIG. 5, an illustration of an acoustic waveguide 500 formed by a continuous three-dimensional curved surface is shown. The horn has a circular throat end 502 and a mouth 504. The surface portions that connect the circular throat end 502 and the closed control curve of a mouth 504 are identified as having an upper vertical control curve 506, a lower vertical control curve 508, a right horizontal control curve 510, and a left horizontal control curve 512. The right horizontal control curve 510 and left horizontal control curve

512 may be mirrored about an imaginary centerline 514 and are not convergent-divergent control lines. Similarly, the upper vertical control curve 506 and the lower vertical control curve 508 may be mirrored about the imaginary centerline 516. The control curves may be positioned in the horizontal and vertical planes and discontinuities may be minimized such that continuous curves may be formed. Examples include rational B-spline, parabolic, hyperbolic, ellipsoidal, or exponential curves. ~~In the exemplary embodiment shown in FIG. 5, control curves 506, 508, 510 and 512 are convex relative to the axial centerline of the waveguide structure.~~ In a less desirable embodiment, discontinuities may appear in the surface structure, however, this may limit optimal performance. These discontinuities may also be the result of, or formed during, manufacturing processes. - -

Please replace the paragraph beginning on page 7, line 29, and ending on page 8, line 2, which begins with "The acoustic waveguide 500 formed by the least-energy-surface", with the following paragraph:

- - The acoustic waveguide 500 formed by the least-energy-surface may eliminate the need for diffraction slots. Instead, the area in acoustic waveguide 500 of narrowest width or height pass through the continuous three-dimensional curved surface allowing the wave front to expand smoothly and remain attached to the side surface portions of the wave guide, while minimizing the reliance on geometric diffraction to produce constant directivity or constant coverage. The narrowest point in acoustic waveguide 500 may ~~occurs~~ <u>occur</u> at the circular throat end 502. - -